

Application No. 10/517,277
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Reply to Office Action of Sept-29-2008

Amendments to the Claims:

1. and 2. (Cancelled)

3. (Currently amended) A process of preparing a protein isolate, which comprises:

- (a) crushing oil seeds to form oil and oil seed meal therefrom,
- (b) solvent extracting the oil seed meal to recover residual oil therefrom,
- (c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolventized oil seed meal,
- (d) extracting the desolventized oil seed meal to cause solubilization of protein in said desolventized oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,
- (e) separating the aqueous protein solution from residual oil seed meal,
- (f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,
- (g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles,
- (h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and
- (i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight basis. The process of claim 1 wherein said steps (d) to (i) are effected in a semi-continuous mode of operation.

4. (Currently amended) A process of preparing a protein isolate, which comprises:

- (a) crushing oil seeds to form oil and oil seed meal therefrom,
- (b) solvent extracting the oil seed meal to recover residual oil therefrom,
- (c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolventized oil seed meal,

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(d) extracting the desolvanted oil seed meal to cause solubilization of protein in said desolvanted oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,

(e) separating the aqueous protein solution from residual oil seed meal,

(f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,

(g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles,

(h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and

(i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight basis. The process of claim 1 wherein said steps (d) to (i) are effected in a continuous mode of operation.

5. (Currently amended) The process of ~~claim 2~~ claim 25 wherein said extracting of said desolvanted oil seed meal is effected using an aqueous salt solution having an ionic strength of at least 0.10 and a pH of about 5 to about 6.8 and said aqueous protein solution has a protein content of about 5 to about 40 g/L.

6. (Original) The process of claim 5 wherein said salt solution has an ionic strength of about 0.15 to about 0.6.

7. (Original) The process of claim 5 wherein said salt solution has a pH of about 5.3 to about 6.2.

8. (Previously presented) The process of claim 5 wherein said extracting of said desolvanted oil seed meal is effected with agitation of said aqueous salt solution for about 10 to about 30 minutes.

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9. (Previously presented) The process of claim 8 wherein the concentration said desolventized of oil seed meal in said aqueous salt solution during said extracting step is about 5 to about 15% w/v.

10. (Original) The process of claim 5 wherein said aqueous protein solution resulting from the extraction step has a concentration of about 10 to about 30 g/L.

11. (Previously presented) The process of claim 4 wherein said extraction step is effected by:

(i) continuously mixing said desolventized oil seed meal with an aqueous salt solution having an ionic strength of at least 0.10 and a pH of about 5 to about 6.8 at a temperature of about 5° to about 65°C, and .

(ii) continuously conveying said mixture through a pipe while extracting protein from the desolventized oil seed meal to form an aqueous protein solution having a protein content of about 5 to about 40 g/L for a period of time up to 10 minutes.

12. (Original) The process of claim 11 wherein said salt solution has an ionic strength of about 0.15 to about 0.8.

13. (Original) The process of claim 11 wherein the salt solution has a pH of about 5.3 to about 6.2.

14. (Previously presented) The process of claim 11 wherein the concentration of oil said desolventized seed meal in said aqueous salt solution in said mixing step is about 5 to about 15% w/v.

15. (Previously presented) The process of claim 11 wherein said temperature is at least 35°C.

16. (Original) The process of claim 11 wherein said aqueous protein solution has a protein content of about 10 to about 30 g/L.

17. (Currently amended) A process of preparing a protein isolate, which comprises:

(a) crushing oil seeds to form oil and oil seed meal therefrom,

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(b) solvent extracting the oil seed meal to recover residual oil therefrom,
(c) removing solvent from the extracted oil seed meal at a temperature of
15° to 50°C under vacuum to provide a desolventized oil seed meal,
(d) extracting the desolventized oil seed meal to cause solubilization of
protein in said desolventized oil seed meal and to form an aqueous protein solution
having a pH of about 5 to about 6.8,
(e) separating the aqueous protein solution from residual oil seed meal,
(f) increasing the protein concentration of said aqueous protein solution
while maintaining the ionic strength substantially constant by using a selective
membrane technique to provide a concentrated protein solution,
(g) diluting said concentrated protein solution into chilled water having a
temperature of below 15°C to cause the formation of discrete protein particles in the
aqueous phase in the form of micelles,
(h) settling the protein micelles to form an amorphous, sticky, gelatinous,
gluten-like protein micellar mass, and
(i) recovering the protein micellar mass from supernatant, the protein
micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight
basis. The process of claim 1 wherein said extracting of said desolventized oil seed
meal is effected using an aqueous salt solution having an ionic strength of at least
0.10 and a pH of about 3 to about 5 or about 6.8 to about 9.9 and, following said
separation of the aqueous protein solution from residual oil seed meal, the pH of the
aqueous protein solution is adjusted to a pH of about 5 to about 6.8.

18. (Original) The process of claim 17 wherein said salt solution has a ionic strength
of about 0.15 to about 0.6.

19. (Original) The process of claim 17 wherein the pH of the aqueous protein
solution is adjusted to a pH of 5.3 to about 6.2.

20. (Currently amended) A process of preparing a protein isolate, which comprises:

(a) crushing oil seeds to form oil and oil seed meal therefrom,
(b) solvent extracting the oil seed meal to recover residual oil therefrom,

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(c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolvanted oil seed meal,

(d) extracting the desolvanted oil seed meal to cause solubilization of protein in said desolvanted oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,

(e) separating the aqueous protein solution from residual oil seed meal,

(f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,

(g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles,

(h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and

(i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight basis. The process of claim 1 wherein said desolvanted oil seed meal is desolvanted canola oil seed meal and, following said separating of the aqueous protein solution from the residual canola seed meal, the aqueous protein solution is subjected to a pigment removal step.

21. (Original) The process of claim 20 wherein said pigment removal step is effected by diafiltration of the aqueous protein solution.

22. (Original) The process of claim 20 wherein said pigment removal step is effected by mixing a pigment adsorbing agent with the aqueous protein solution and subsequently removing the pigment adsorbing agent from the aqueous protein solution.

23. (Original) The process of claim 22 wherein the pigment adsorbing agent is powdered activated carbon.

24. (Currently amended) A process of preparing a protein isolate, which comprises:

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- (a) crushing oil seeds to form oil and oil seed meal therefrom,
- (b) solvent extracting the oil seed meal to recover residual oil therefrom,
- (c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolventized oil seed meal,
- (d) extracting the desolventized oil seed meal to cause solubilization of protein in said desolventized oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,
- (e) separating the aqueous protein solution from residual oil seed meal,
- (f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,
- (g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles,
- (h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and
- (i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight basis. The process of claim 1 wherein said desolventized oil seed meal is extracted with water and subsequent thereto salt is added to the resulting aqueous protein solution to provide an aqueous protein solution having an ionic strength of at least 0.10.

25. (Previously presented) A process of preparing a protein isolate, which comprises:

- (a) crushing oil seeds to form oil and oil seed meal therefrom,
- (b) solvent extracting the oil seed meal to recover residual oil therefrom,
- (c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolventized oil seed meal,

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(d) extracting the desolvanted oil seed meal to cause solubilization of protein in said desolvanted oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,

(e) separating the aqueous protein solution from residual oil seed meal,

(f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,

(g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles,

(h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and

(i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight basis, The process of claim 1 wherein said concentration step is effected by ultrafiltration to produce a concentrated protein solution having a protein content of at least 200 g/L.

26. (Previously presented) The process of claim 25 wherein said concentration step is effected to produce a concentrated protein solution having a protein content of at least 250 g/L.

27. (Previously presented) The process of claim 25 wherein said concentrated protein solution is warmed to a temperature of at least 20°C to decrease the viscosity of the concentrated protein solution but not beyond a temperature above which the temperature of the concentrated protein solution does not permit micelle formation.

28. (Original) The process of claim 27 wherein said concentrated protein solution is warmed to a temperature of about 25°C to about 40°C.

29. (Currently amended) The process of claim 25 wherein said concentrated protein solution is diluted by about 15 fold or less by adding the

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concentrated protein solution into a body of water having the volume required to achieve the desired degree of dilution.

30. (Previously presented) The process of claim 29 wherein said body of water has a temperature of less than 10°C.

31. (Original) The process of claim 30 wherein said concentrated protein solution is diluted by about 10 fold or less.

32. (Original) The process of claim 3 wherein said concentrated protein solution is continuously mixed with said chilled water to provide a dilution of the concentrated protein solution by about 15 fold or less.

33. (Previously presented) The process of claim 32 wherein said chilled water has a temperature of less than 10°C.

34. (Original) The process of claim 33 wherein said dilution is by about 10 fold or less.

35. (Currently amended) The process of claim 1 claim 25 wherein the recovered protein micellar mass is dried to a proteinaceous powder.

36. (Currently amended) A process of preparing a protein isolate, which comprises:

- (a) crushing oil seeds to form oil and oil seed meal therefrom,
- (b) solvent extracting the oil seed meal to recover residual oil therefrom,
- (c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolventized oil seed meal,
- (d) extracting the desolventized oil seed meal to cause solubilization of protein in said desolventized oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,
- (e) separating the aqueous protein solution from residual oil seed meal,
- (f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,

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(g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles,

(h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and

(i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight basis. The process of claim 4 wherein said recovered protein micellar mass has a protein content of at least 100 wt% (N x 6.25).

37. (Currently amended) A process of preparing a protein isolate, which comprises:

(a) crushing oil seeds to form oil and oil seed meal therefrom,

(b) solvent extracting the oil seed meal to recover residual oil therefrom,

(c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolventized oil seed meal,

(d) extracting the desolventized oil seed meal to cause solubilization of protein in said desolventized oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,

(e) separating the aqueous protein solution from residual oil seed meal,

(f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,

(g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles,

(h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and

(i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight basis. The process of claim 1 wherein said oil seed meal is canola seed meal and, following recovering of the protein micellar mass therefrom, the supernatant is

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processed, on a batch, semi-continuous or continuous basis, to recover additional quantities of protein isolate therefrom.

38. (Previously presented) The process of claim 37 wherein said additional quantities of protein isolate are recovered from the supernatant by concentrating the supernatant to a protein concentration of about 100 to about 400 g/L, and drying the concentrated supernatant.

39. (Previously presented) The process of claim 37 wherein said additional quantities of protein isolate are recovered from the supernatant by concentrating the supernatant to a protein concentration of about 100 to about 400 g/L, mixing the concentrated supernatant with the recovered protein micellar mass, and drying the mixture.

40. (Previously presented) The process of claim 37 wherein said additional quantities of protein isolate are recovered from the supernatant by concentrating the supernatant to a protein concentration of about 100 to about 400 g/L, mixing a portion of said concentrated supernatant with at least a portion of the recovered protein micellar mass, and drying the resulting mixture.

41. (Original) The process of claim 40 wherein the remainder of the concentrated supernatant is dried and any remainder of the recovered protein micellar mass is dried.

42. (Currently amended) A process of preparing a protein isolate, which comprises:
(a) crushing oil seeds to form oil and oil seed meal therefrom,
(b) solvent extracting the oil seed meal to recover residual oil therefrom,
(c) removing solvent from the extracted oil seed meal at a temperature of 15° to 50°C under vacuum to provide a desolvanted oil seed meal,
(d) extracting the desolvanted oil seed meal to cause solubilization of protein in said desolvanted oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,
(e) separating the aqueous protein solution from residual oil seed meal,

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(f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,

(g) diluting said concentrated protein solution into chilled water having a temperature of below 15°C to cause the formation of discrete protein particles in the aqueous phase in the form of micelles,

(h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and

(i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least 90 wt% (N x 6.25) on a dry weight basis. The process of claim 1 wherein, as an alternative to said diluting, settling and recovering steps, the concentrated protein solution is dialyzed to reduce the salt content thereof and to cause the formation of protein micelles, and recovering a protein isolate from the dialyzed concentrated protein solution having a protein content of at least 100 wt% (N x 6.25) on a dry weight basis.

43. (Original) The process of claim 42 wherein said protein isolate recovery is effected by drying the dialyzed concentrated protein solution.

44. (Currently amended) The process of claim 1 claim 25 wherein said oil seed meal is canola oil seed meal.

45. (Original) The process of claim 44 wherein the canola oil seed meal is cold pressed canola oil seed meal.

46. (Original) The process of claim 44 wherein the canola oil seed meal is derived from a non-genetically modified canola oil seed.

47. (Cancelled)

48. (Original) The process of claim 1 wherein said oil seed meal is mustard seed meal.

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49. (Currently amended) The process of ~~claim 1~~ claim 25 wherein said solvent removal step is effected ~~by air-dec solventizing~~ at a temperature of about 15° to about 25°C.

50. (Cancelled)

51. (Previously presented) The process of claim 38 wherein the supernatant is concentrated to a concentration of about 200 to about 300 g/L.

52. (Previously presented) The process of claim 39 wherein the supernatant is concentrated to a concentration of about 200 to about 300 g/L.

53. (Previously presented) The process of claim 40 wherein the supernatant is concentrated to a concentration of about 200 to about 300 g/L.